A Review of Alcohol Pricing and its Effects on Alcohol Consumption and Alcohol-Related Harm

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Conflicting Interest: None declared

This article has been peer reviewed.

Article Submitted on: 17th February 2011

Article Accepted on: 19th March 2011

Funding Sources: None Declared

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THE ISSUE

Alcohol has a complex relationship with any given society. On one hand, it may have some benefits by providing a means of leisure and socialization and a source of revenue through taxation of its sales while on the other hand; it has harmful effects by being a direct cause of many medical illnesses, accidents and crime [1]. The number of deaths directly related to alcohol in England in 2008 were 6,769, which is a 24% increase from 2001 [2]. To combat this rising number of alcohol-related problems, the government has introduced various strategies and indicators in order to monitor the effectiveness of interventions. NI39 is one such national indicator for alcohol-related harm, which measures alcohol-related admissions per 100,000 populations on a quarterly and yearly basis, with the first quarter starting in April and the last quarter ending in March. This rate (NI39) for England in 2009/2010 was 1,743/100,000, which is a 10% increase from 2008/2009 statistics [3]. Furthermore, the NI39 estimates for the first two quarters of 2010/11 are about 942/100,000, predicting a 9% further increase from previous year [4]. In addition, there was an average of 271 alcohol dependence-related prescriptions in England per 100,000 in 2009, costing the National Health Service about £2.38 million [5]. Hence, we can see that the burden of alcohol misuse in England is huge, making it a priority problem in public health.

According to the economics, the demand of a product is inversely proportional to its price, which means that an increase in the price of a product will decrease its demand and vice versa. Alcohol now is 70% more affordable than it was in 1980 [5], which may be related to increasing alcohol misuse. Therefore, pricing has been regarded as one of the central tools in alcohol policy [6]. On 18th January 2011, the government set a minimum price of alcohol for England and Wales [7] resulting in a great amount of discussion on the effects of alcohol price, alcohol consumption and alcohol-related harm. This paper aims to review the current literature and to examine the evidence for an association between alcohol price, alcohol consumption and alcohol-related harm.

IDENTIFICATION OF EVIDENCE-LITERATURE SEARCH

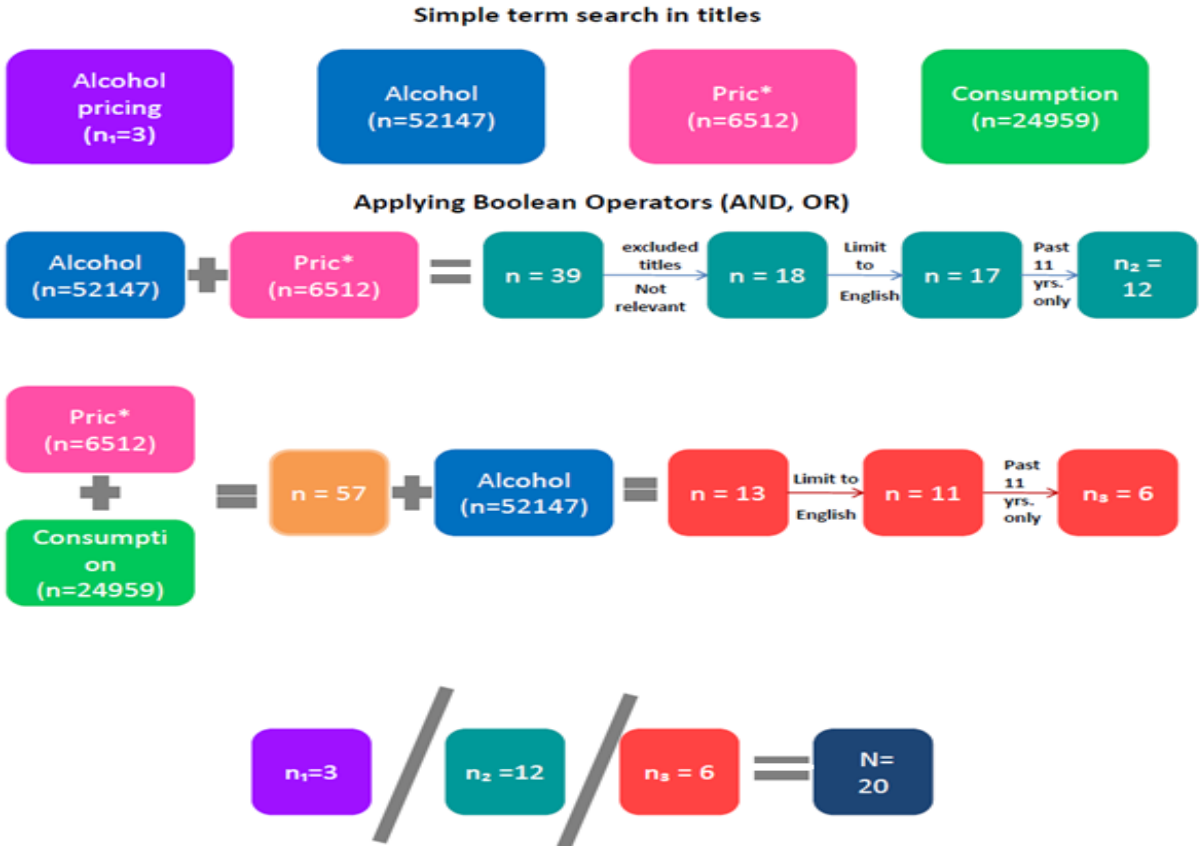
Literature search was done using the MEDLINE database (1954-present) and the Google Scholar search engine. In addition, the relevant reports published in the UK were also identified through expert opinion and included in the review. The criteria for inclusion into the review were as follows

- Any alcohol pricing intervention as the main exposure of interest
- Outcome measure: Alcohol consumption and alcohol-related harm in terms of elasticity or proportions
- Observational study or systematic review
- Language restricted to English
- Articles published after 2000
- Any country

We used the search string 'Alcohol pricing', 'Alcohol', 'Consumption' and 'Pric*' (where '*' indicates truncation to include all forms of the root word) including only those articles that met the inclusion criteria (Figure 1). Our search identified 20 relevant published articles. Literature was searched on the Google Scholar search engine using the phrase 'Alcohol tax and pricing'. About 15 articles were found with titles relevant to the topic. After excluding the articles older than 2000, 13 articles were included.

In an attempt to include an expert opinion into the review, a meeting was set up with the commissioner of alcohol services at the Derby Alcohol Action Team, who suggested the reports included in the review. Another review by Centre for Economic and Business Research was also found, while searching for more reports. However, it was excluded from the analysis as it was commissioned by SABMiller plc and therefore was considered to

Fig. 1



Note: '+' denotes Boolean Operator 'AND' & '/' denotes 'OR'

have a potential for bias.

REVIEW OF EVIDENCE EFFECTS OF ALOCHOL PRICING AND TAXATION ON ALCOHOL CONSUMPTION

Overall, the literature supports the hypothesis that alcohol pricing is closely related to alcohol consumption and with an increase in alcohol prices, the demand for alcohol decreases. In a systematic review of 72 studies, 38 studies found that alcohol consumption was inversely related to alcohol price [8]. The elasticity (measure of change in demand with a change in price) for beer in the study was -0.5, which means that with a 1% increase in beer price, consumption decreased by 0.5%. The elasticity of wine was -0.79 [8]. Another systematic review found similar results with elasticity of -0.46 for beer, -0.69 for wine and -0.80 for spirits. Furthermore, it found a significant relationship ($p<0.001$) between alcohol price measures and indices of alcohol sales or consumption ($r = -0.44$) [9] Individual epidemiological studies from different countries identified through our search strategy have also demonstrated this inverse relationship. A study in alcohol consumption from 1982-2008. In 2004, alcohol prices in Finland decreased by a third. This resulted in an increase in alcohol consumption, especially in the 45-64 years age group and in individuals with low levels of education [10]. Similar results were found in a longitudinal study in Switzerland before and after alcohol tax reforms. This study concluded that spirit consumption significantly increased by 28.6% with a decrease in prices, after adjusting for significant correlates of spirit consumption [11, 12] However, consumption of wine, beer or overall alcohol did not change significantly [12]. This finding is consistent with findings of another study conducted in Denmark, Finland and Southern Sweden after alcohol tax changes were made. Alcohol consumption in Denmark and Sweden decreased with a decrease in alcohol tax. In contrast, there was no change in consumption of alcohol in Southern Sweden following tax changes [13]. This study included a large cohort from 3 countries and it found

contradictory results across countries. Several factors might be responsible for lack of consistent results across countries including the cross-sectional nature of the study, under-representation of a high-consumption subpopulation, or differences in alcohol export policy between the countries. While there are no epidemiological studies in the UK on this topic, data exists from economic modeling and independent reviews. Purshouse and colleagues developed an economic model around alcohol pricing policies which shows that a 10% increase in alcohol price may decrease the consumption by 4.4% [14] The Sheffield group (2008) and the Home Office (2011) reviews also support the findings that increase in price is related to decrease in consumption [15, 16]

WHICH GROUP IS MORE RESPONSIVE TO CHANGES IN ALCOHOL PRICES?

Studies show that the subpopulation of alcohol drinkers that is most likely to reduce consumption with an increase in alcohol price is of heavy drinkers [14-17] with an average elasticity of -0.28 ($p<0.01$).[9] However, Meier and colleagues suggest that moderate drinkers (elasticity -0.47) are more price sensitive than heavy drinkers (elasticity -0.21) [18]. This may have important implications as 45% of the alcohol is consumed by 10% of the heavy drinkers.[18] Moreover, these findings indicate that increasing the price of alcohol would not have a major impact on light and occasional drinkers, an argument routinely forwarded by the alcohol industry. It has been indicated that a 10% alcohol price rise decreases weekly consumption in 11-18 age group and 18-24 age group hazardous drinkers by 5.3% and 6% respectively. Other literature also suggests that younger individuals are more elastic to changes in price than older individuals and usually respond to a price increase by decreasing their consumption [11, 13, 15, 19] This can reduce the disproportionately high incidence of alcohol-related problems, such as road traffic accidents, in the younger age group [19]

QUALITY-QUANTITY TARDE OFF-SWITCHING TO CHEAPER ALCOHOL

Literature also indicates that with higher alcohol prices consumers may not reduce their intake but switch brands and venues and trade quantity for quality [18, 20] This consumer behavior was observed in a study from Germany where alcopop (sweetened, spirit-based drink) consumption declined with an increase in tax but was substituted by spirit. In order to avoid this switching behavior, it is important to regulate the cost of all alcoholic beverages, as was done in Canada, instead of regulating individual beverages.

In addition, it is imperative to consider population heterogeneity and also take into account the addictive nature of alcohol, when planning for any cost related intervention.

ASSOCIATION BETWEEN PRICING AND ALCOHOL-RELATED HARM

A study done in Florida on the effects of alcohol taxes points out that 69 deaths could be saved/ month with 1 unit increase in alcohol tax ($p=0.007$) with elasticity estimate of -0.22 ($p=0.06$). On the similar lines, Finland encountered 16-31% increase in alcohol disease mortality with major decreases in tax [21]. A systematic review on the effects of tax on morbidity and mortality found a negative effect of alcohol price on alcohol related diseases and injury outcomes ($r=-0.347$), violence ($r=-0.22$), suicide ($r=-0.48$), traffic crash outcomes ($r=-0.112$), sexually transmitted diseases ($r=-0.055$), other drug use ($r=-0.022$) and crime ($r=-0.014$) [22]. Another U.S. study found that a one dollar increase in spirit tax may reduce the incidence of cirrhosis by 5.4% ($p<0.05$) and a one cent increase in tax per ounce of alcohol would reduce its sales by 2.1% and 0.483% reduction in all-cause mortality rates ($p<0.05$) [8]. In addition, increase in alcohol tax also resulted in reduction in the rates of rapes, robbery, homicides and violence towards children [8]. It was estimated that a 10% increase in alcohol price will reduce hospital admissions by 10,100 and deaths by 232 per year. Direct crime costs may also be reduced by £70m/year [23]. All these saved costs and increased revenue may then be channeled into other programs to reduce alcohol-related harm [8].

BIAS, CONFOUNDING AND LIMITATIONS

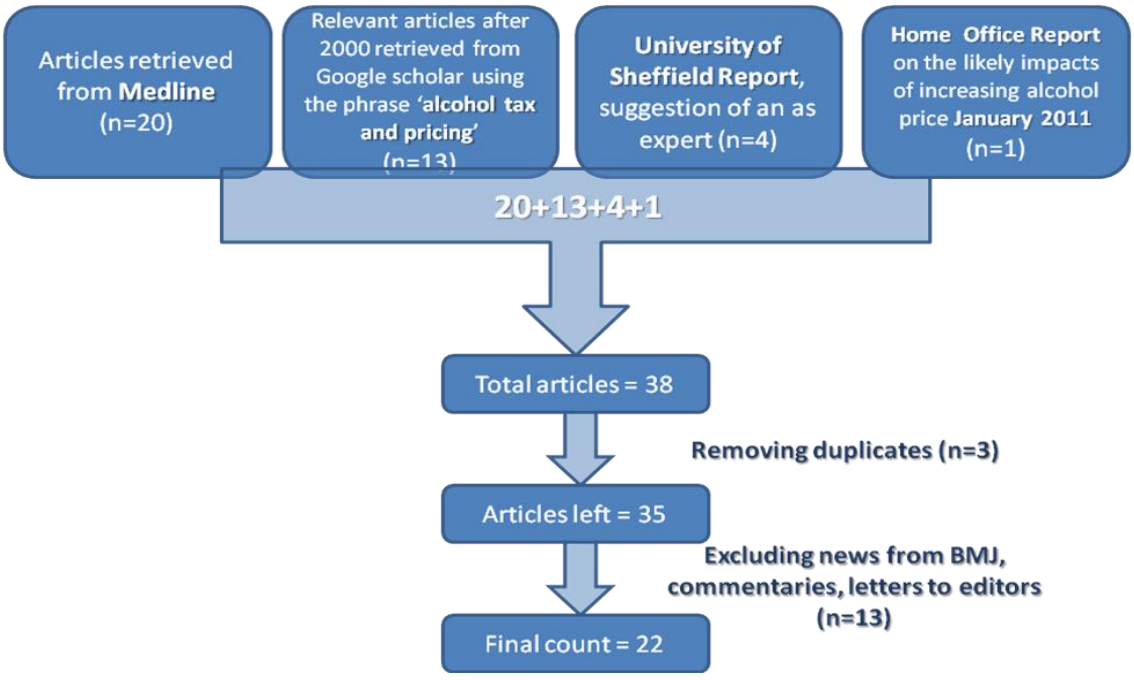
While most of the literature discussed in this review highlights a strong association between alcohol pricing and alcohol consumption, this review was based on a limited number of electronic databases. In addition, we limited our search to only those articles that had search terms in the title so as to include only the most relevant articles. It is possible that we might have identified additional studies if other databases such as ISI Web of Science, ScienceDirect and EMBASE were also included. There may also be a lot of grey literature relevant to the topic which was not identified. However, we did include government reports which are usually summaries of high-quality evidence and we think that this is the strength of our study. Furthermore, most of the studies we found were reviews, cross-sectional studies or time-series analysis with limited number of longitudinal studies and natural

experiments. Some studies may also have ecological fallacy as they compare trends between different countries and therefore the results may not extrapolate to an individual level. It is also important to acknowledge that measurement of alcohol consumption is complex and there may be measurement errors in individual studies, resulting in under-estimation or under-reporting of consumption, under-representation of the consumers and the best proxy measure may not have been taken for consumption indices. Additionally, with cross-sectional studies, there is a high probability of reporting and recall bias, which may impact the overall conclusions of this review. It is possible that results of some studies may not be generalizable to other countries. Countries differ from each other at several levels such as socially, economically and politically. It is possible that a wave of anti-alcohol sentiment precedes increase in alcohol tax and this sentiment and not the final alcohol price may be the factor responsible for decrease in alcohol consumption. There may also be multiple confounders in the association presented such as increase in imports when the price goes up and anti-alcohol environment in the region which may explain some of the effects. Lastly, it is important to acknowledge that alcohol pricing is just one factor that may have an effect on alcohol consumption and there may be several other individual, social, cultural and behavioral factors that influence the total alcohol consumption. In order to decrease alcohol use, a close attention to all these factors and a multipronged approach is more likely to succeed.

CONCLUSION

The upward slope in alcohol-related medical and social problems calls for immediate and effective interventions to curb this rise. In light of the literature cited above, a strategy of increasing alcohol price can greatly decrease alcohol consumption and may reduce alcohol-related harm. The minimum pricing policy introduced in January, which was implemented to control the below-cost selling of alcohol, is just one aspect of this strategy. The minimum pricing policy alone is not the solution; alcohol use is a very complex problem and needs multifaceted interventions to combat it. Other equally effective interventions in the sectors of health promotion, health protection and treatment should be implemented to deal with this problem effectively. Furthermore, in economic and political terms, other policies related to alcohol pricing such as targeted taxation, taxation based on volume etc need to be considered.

Fig 2
Literature Search Strategy



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